

CLAIMS

What is claimed is:

1. A method of making a catalyst for use in a hydrocarbon synthesis reactor comprising:
 - A) providing a catalyst in a reduction vessel, wherein the catalyst comprises particles;
 - B) passing a reducing gas over the catalyst in the reduction vessel under suitable conditions so as to obtain a reduced catalyst;
 - C) providing a hydrocarbon liquid in a stripping vessel;
 - D) contacting the hydrocarbon liquid with a stripping gas in the stripping vessel to generate a stripped hydrocarbon liquid, wherein the stripped hydrocarbon liquid is substantially free of dissolved oxygen;
 - E) mixing the reduced catalyst and at least a portion of the stripped hydrocarbon liquid to provide a slurry;
 - F) fluidizing the slurry so as to distribute the reduced catalyst throughout the stripped hydrocarbon liquid; and
 - G) contacting a reactant gas comprising hydrogen and carbon monoxide under conversion promoting conditions with at least a portion of said slurry to convert at least a portion of the reactant gas to hydrocarbons.
2. The method according to claim 1 wherein step (E) takes place in the stripping vessel.
3. The method according to claim 2 further including transferring the reduced catalyst under non-oxidizing conditions to the stripping vessel comprising the stripped hydrocarbon liquid.

4. The method according to claim 3 wherein transferring the reduced catalyst takes place in the presence of at least one gas selected from the group consisting of hydrogen, nitrogen, a C₁-C₅ gaseous hydrocarbon with 5 carbon atoms or less, natural gas, any inert gas, and mixtures thereof.
5. The method according to claim 1 wherein step (E) takes place in the reduction vessel.
6. The method according to claim 5 further including transferring at least a portion of the stripped hydrocarbon liquid to the reduction vessel comprising the reduced catalyst.
7. The method according to claim 1 wherein step (G) takes place in at least one hydrocarbon synthesis reactor, and wherein steps (E) and (F) take place in a different vessel.
8. The method according to claim 7 further including
(H) transferring at least a portion of the slurry to the at one least hydrocarbon synthesis reactor.
9. The method according to claim 8 wherein the hydrocarbon synthesis reactor is empty prior to step (H).
10. The method according to claim 8 wherein the hydrocarbon synthesis reactor is partially filled with at least a portion of the stripped hydrocarbon liquid obtained in step (D) before the transfer step (H).

11. The method according to claim 8 wherein the hydrocarbon synthesis reactor is partially filled with a hydrocarbonaceous liquid before the transfer step (H).
12. The method according to claim 11 wherein the hydrocarbonaceous liquid comprises at least one hydrocarbon with 20 or more carbon atoms; a wax; a paraffinic oil; a base oil; or mixtures thereof.
13. The method according to claim 8 wherein the hydrocarbon synthesis reactor is in a pre-operational state.
14. The method according to claim 8 wherein the hydrocarbon synthesis reactor is in an operating state.
15. The method according to claim 1 wherein steps (E), (F) and (G) take place in at least one hydrocarbon synthesis reactor.
16. The method according to claim 1 wherein the catalyst comprises at least one catalytic metal selected from the group consisting of metals from Groups 8, 9, 10 of the Periodic Table.
17. The method according to claim 1 wherein the catalyst comprises at least one catalytic metal in an oxide form.

18. The method according to claim 17 wherein the reduced catalyst comprises at least a portion of the catalytic metal in a zero-valent oxidation state.
19. The method according to claim 1 wherein the catalyst comprises at least one catalytic metal selected from the group consisting of cobalt, iron, ruthenium, nickel, oxides thereof, and combinations thereof.
20. The method according to claim 19 wherein the catalyst further comprises at least one promoter selected from the group consisting of ruthenium, rhenium, platinum, palladium, silver, boron, manganese, lithium, sodium, copper, potassium and combination thereof.
21. The method according to claim 19 wherein the catalytic metal comprises cobalt.
22. The method according to claim 21 wherein the catalyst further comprises at least one promoter selected from the group consisting of ruthenium, rhenium, platinum, palladium, silver, boron, and combinations thereof.
23. The method according to claim 21 wherein the catalyst further comprises a support comprising at least one element selected from the group consisting of silica, alumina, titania, and combinations thereof.

24. The method according to claim 1 wherein the catalyst comprises a support comprising at least one oxide of the elements selected from the group consisting of silicon, aluminum, titanium, thorium, zirconium, boron, and combinations thereof.
25. The method according to claim 1 wherein the catalyst comprises particles of weight average particle size between about 30 microns and about 150 microns.
26. The method according to claim 1 wherein the reducing gas comprises hydrogen.
27. The method according to claim 26 wherein the reducing gas further comprises one gas selected from the group consisting of nitrogen, carbon dioxide, any C₁-C₅ light hydrocarbon, natural gas, an inert gas, and mixtures thereof.
28. The method according to claim 1 wherein the reducing gas has a volumetric flow rate between about 0.1 m³/hr/kg catalyst and about 10 m³/hr/kg catalyst.
29. The method according to claim 1 wherein step (B) is performed at a temperature between about 200 °C and about 500 °C.
30. The method according to claim 1 wherein step (B) is performed at a pressure between about 0.1 psig and about 50 psig.

31. The method according to claim 1 wherein the reduction vessel of step (B) is selected from the group consisting of fixed bed, fluidized bed, and rotary kilns.
32. The method according to claim 1 wherein step (B) takes place in a fluidized bed.
33. The method according to claim 1 wherein step (B) takes place in a slurry bed.
34. The method according to claim 1 wherein the reduction vessel comprises a gas recycle loop, and further wherein at least a portion of the gas used in step (B) is recycled through the gas recycle loop to the reduction vessel.
35. The method according to claim 34 wherein step (B) further comprises producing water, and further wherein the method includes removing at least a portion of said produced water from the reducing gas exiting the reduction vessel.
36. The method according to claim 1 wherein the hydrocarbon liquid comprises wax, paraffin oil, base oil, a hydrocarbon with 20 or more carbon atoms, or mixtures thereof.
37. The method according to claim 1 wherein the hydrocarbon liquid comprises wax, and wherein at least a portion of said wax is produced in a hydrocarbon synthesis reactor.

38. The method according to claim 1 wherein the hydrocarbon liquid comprises wax, and further wherein step (D) includes a temperature-controlling means effective for maintaining the wax in a molten state.
39. The method according to claim 1 wherein the hydrocarbon liquid contains mostly paraffins.
40. The method according to claim 1 wherein the stripped hydrocarbon liquid has a molar fraction for O₂ less than 0.12.
41. The method according to claim 1 further comprising heating the hydrocarbon liquid, heating the stripped hydrocarbon liquid, heating the slurry, or combinations thereof.
42. The method according to claim 1 wherein the stripping gas comprises a gas selected from the group consisting of nitrogen, hydrogen, carbon dioxide, carbon monoxide, any gaseous hydrocarbon with 5 carbon atoms or less, natural gas, methane, and mixtures thereof.
43. The method according to claim 1 wherein step (D) is performed for a time period sufficient to achieve a dissolved O₂ content in the stripped hydrocarbon liquid not more than half of the dissolved O₂ content of the liquid hydrocarbon.
44. The method according to claim 1, wherein step (G) is performed in at least one hydrocarbon synthesis reactor comprising a slurry bubble column reactor.

45. The method according to claim 1 wherein step (G) is performed in at least one hydrocarbon synthesis comprising a Fischer-Tropsch synthesis.
46. The method according to claim 1 wherein step (E) comprises feeding a fluidization gas comprising a gas selected from the group consisting of hydrogen, nitrogen, a gaseous hydrocarbon with 5 carbon atoms or less, natural gas, an inert gas, carbon dioxide, carbon monoxide, synthesis gas, and combinations thereof.
47. The method according to claim 1 wherein step (F) provides at least one means for mixing in step (E).
48. The method according to claim 1 wherein the method is effective for delivering from 1 % to 100% of the catalyst slurry required for at least one hydrocarbon synthesis reactor.
49. The method according to claim 1 wherein step (E) is performed in more than one vessel.
50. The method according to claim 1 wherein the method is effective for delivering the catalyst slurry in an amount sufficient for more than one hydrocarbon synthesis reactor.
51. The method according to claim 1 wherein steps (A) - (G) are performed in proximity to each other.

52. A method for making a catalyst slurry for use in a hydrocarbon synthesis reactor, comprising:

- a) reducing a catalyst comprising a catalytic metal in an oxide form under suitable conditions to provide a reduced catalyst;
- b) mixing the reduced catalyst with a substantially O₂-free hydrocarbon liquid under suitable conditions to provide a catalyst slurry; and
- c) contacting a reactant gas comprising hydrogen and carbon monoxide under conversion promoting conditions in at least one hydrocarbon synthesis reactor comprising at least a portion of said catalyst slurry so as to convert at least a portion of the reactant gas to hydrocarbons,

wherein steps a), b), and c) are performed in proximity of each other.